Assun Motor

Product Manual

For Brushless DC Motor

of

AM-BL2453AN Series

1st edition. October, 2019.

Contents

1. About the Manual

1.1 Validity of This Document

The product manual document here is used for AM-BL2453AN series product by Assun Motor which is direct current brushless motor with hall sensors. The manual has made detailed description to the safety and functional usage of this motor product series. It helps the professional user to install and connect the motor, and also guide the user in relevant control function usage.

All data in this manual are based on the actual manufacturing and standard testing condition of AM-BL2453AN series product. Standard testing condition is when the motor installed horizontally and environment temperature is 25℃.

For relevant parameter summaries of the product series, please refer to Appendix 1 “Product Series Parameters”; For specified standard model or customized model, please refer to Appendix 2 “Detailed Product Drawing and Parameter”.

1.2 Using This Document

Please read this document carefully before install and set-up the product. Please pay extra attention to the second chapter “Product Safety”, and strictly follow the warnings and instructions.

Please retain this document throughout the entire working life of the product, and keep the document accessible to the operating and, if necessary, maintenance personnel at all times.

Pass a copy of this document on to any subsequent owner or user of the product.

1.3 Definition of Terms

Term	Meaning
PWM	Pulse Width Modulation
CW/CCW	Clockwise/Counter Clockwise
FG Pulse	Frequency Generator Pulse
VIL/VIH	Voltage Input Low / Voltage Input High
Pin	Control Function Connect Pin
Cable	Power Connection Cable
GND	Ground / Negative Pole
Vcc	Direct Current Voltage
RPM	Revolution per Minute

1.4 Definition of Symbols

Caution! Hazard to persons. Disregard may lead to injury.

Warning! Improper operation will cause product damage.

Caution! Hazardous due to hot surface. Disregard may lead to burns.

2. Product Safety

2.1 Intended Product Usage

The Assun Motor AM-BL2453AN series DC brushless motor product, which we are describing here in this manual, are used for rotating power output under rated DC supply. It is suitable for multi-types of DC driving systems, such as high-speed centrifuge equipment, automation system actuators and many other precision driving systems. The hall sensor is integrated inside the motor, and functions such as PWM speed control, CW/CCW direction change, RPM output and Brake can be achieved after connection with a suitable controller.

The product must be properly installed when in use, and shall be operated in an environment with good heat dissipation conditions. In normal installation condition, when the operational parameters have not exceeded the maximum continuous values, winding temperature must be maintained below 85℃. The product can be used alone or coupled to a gearbox to achieve ideal output torque and RPM.

The product is not suitable for operation in environments with high humid or excessive dust. During the operation, please follow the parameter limits in the appendices to adjust the power supply and running state, so as to achieve the optimum operational output and longest product lifetime.

For usage of product in special environment, please contact our local sales or service staff for consultancy and get the relevant advice or customized service.

This product is NOT SUITABLE for applications where the failure of the product could result in the death of an individual or group of individuals.

2.2 Product Usage Safety

The product is a high-speed rotating device. Please make sure the product is properly mounted before commencement of operation to prevent potential hazards to people or equipment. Please refer to Chapter 4.1 of this manual for further installation guidance.

Motor surface temperature could be high after long term operation. Please exercise caution when touching or handling the product.

Power supply must be filtered DC. The input voltage shall be within the rated value for normal operation. Current cannot be over rated value continuously so as to avoid overheating and damaging the motor components.

Power supply connection must be strictly according to the designated connection order. Wrong cable connection will seriously damage the internal electronics and lead to malfunction of the motor. For detailed power connection guidance, refer to Chapter 4.1.

Please install the motor in an environment with good heat sinking and/or ventilation. Inadequate heat dissipation will lead to the motor winding temperature exceeding the limit of 85℃ and will cause thermal damage to the internal electronic parts and winding, resulting in motor malfunction and/or failure.

Please use the motor according to the parameter limits in the appendix, otherwise it may cause the motor to be exceed current limits or overheat, which could lead to irreversible damage to the motor.

The motor is not suitable for operating in high humid and dusty environments. High humidity or excessive dust concentration could lower the motor performance and shorten the motor lifetime.

The product is a precision Brushless DC motor with sensitive internal electronic components. Please do not personally disassemble the product.

2.3 Product Disposal/Recycling

This series of motor products is manufactured with multiple types of metals, alloy materials, chemical adhesives and lubricants. Please dispose it properly as recyclable material. For a detailed product material listing please refer to Chapter 3.1.

3. Product Series Information

3.1 Product Series Structure Introduction

AM-BL2453AN series products is a series of precision DC brushless motors with internal electronics and inner rotating rotor. Case diameter is φ24mm, case length is 53mm, rated power is 20-30W, with a net weight of approximately 127g. For detailed series information and parameters please refer to Appendix 1.

The series product is inner rotor brushless dc motor, relying on the driver electronics to energize the stator winding in sequence to make the magnetic poles rotate and thus attract the permanent magnetic rotors to rotate in synchronization. The product's basic structure is depicted in illustration 1.

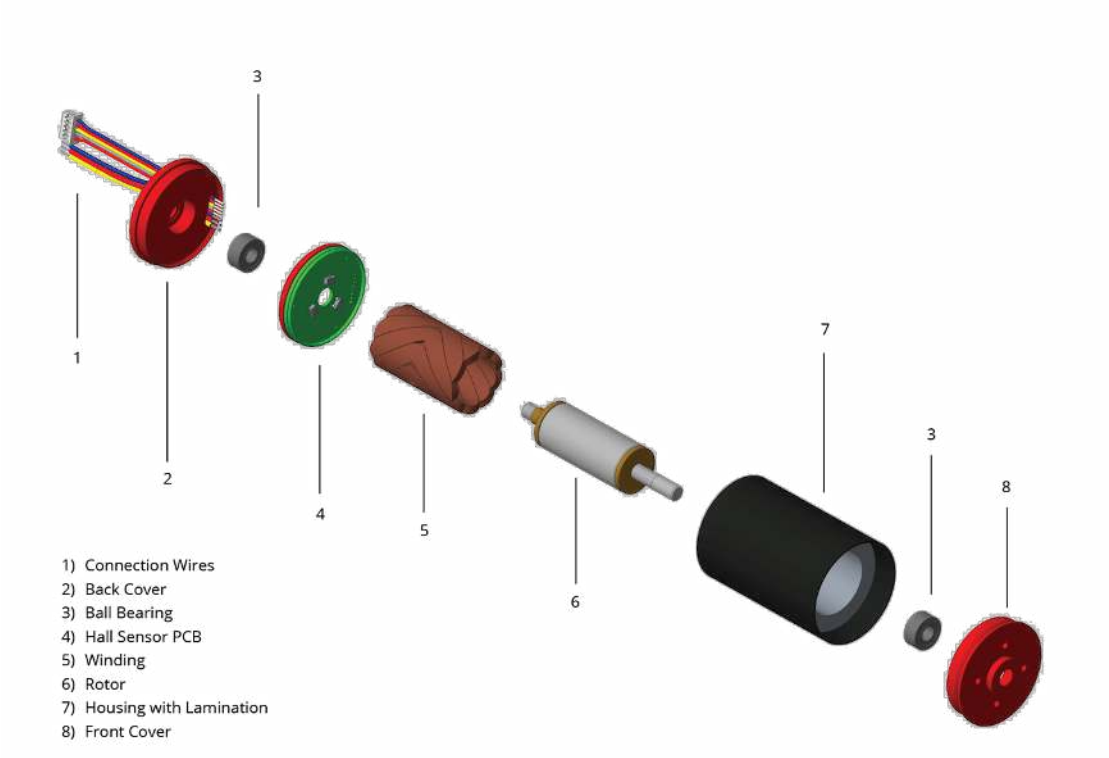

Illustration 1. Exploded Product View

This series of product are manufactured using materials using multi-types of metal, alloy material and chemical products. Specific material usage as shown in Table 1.

Table 1. Product Material Matrix

Components	End Cover	Winding	Bearing	Rotor Magnet	Rotor Shaft	Housing	Cable Core
Material	Stainless Steel	Copper	Stainless Steel	Sintered NdFeB	Stainless Steel	Aluminum Alloy	Copper
Components	Cable Insulation	PCB Board	PCB Circuit	Glue	Grease	Cushion	Other Materials
Material	Plastic (Teflon)	Glass Fiber & Copper	Copper	Epoxy Resin	Fluorine Grease	Stainless Steel	Precious Metals; Silicon.

3.2 Product Model Information

To make it convenient for the customer to choose a specific part number or model and understand the part number methodology, please refer below in Illustration 2 the explanation for model number composition principle.

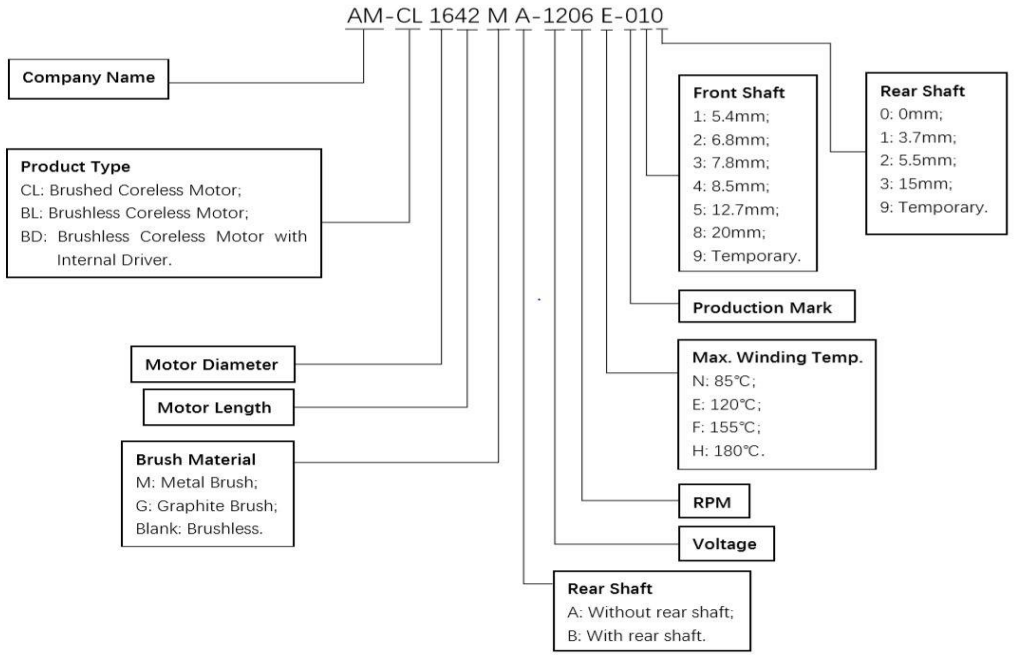

Illustration 2. Part Number Nomenclature

Customers can choose suitable products based on their types and characteristics shown in the part number methodology. If products with special characteristics are required, please contact our regional sales person for customized service.

4. Product Function and Usage

The Product Series has five control pins and threepower supply cables. Rotating could be CW (Clockwise) or CCW (Counter Clockwise), the direction is defined when looking from front end of motor.

Five control pins are Hall Power (Pin 1, red), Hall Ground (Pin 2, black), Hall A (Pin 3, yellow), Hall B (Pin 4, red), Hall C (Pin 5, blue). When the motor running, these five pins should be connected to relevant controller boards for normal operation of Hall electronics.

Three power cables are Stator Phase A (Yellow), Stator Phase B (Red) and Stator Phase C (Blue).

Note: the cable connection sequence of phases for Hall and Power must comply for motor to run normally.

4.1 Motor Installation and Power Connection

Motor must be properly and securely mounted., typically utilizing the treaded holes in the front cover to fix the motor. It will be proposed to install the motor to metal parts, or installed in well ventilated environments for better heat dissipation.

⚠ There are three AWG26# power cables, Power cable connection sequence must comply with the Hall sensor cable. If the Hall sensor cable from right to left are yellow, red and blue, then same color sequence should be complied by the Power cable when connecting to controller board. When cable connected in wrong sequence, motor internal parts could be broken and cause motor malfunction.

Now we use the speed driver produced by Assun Motor as an example for cable connection.

Graph 3. Speed Driver (Example)

There are four connectors in the driver shown above, Right Down is the P1 connector for DC power supply, right side connects to power positive, left side connects to power negative. Left Down is the P3 connector for control signal, from right to left, there are totally 6 pins, each for different function control. Function table as following.

Table 2. Assun Speed Driver Function Table

No. (Right to Left)	Pin Name	Function
1	GND	Ground
2	GND	Ground
3	BR	Low voltage brake; High/zero voltage normal
4	EN	Low voltage motor rotate, high voltage/open motor stop. Meanwhile could be used for PWM speed control (Frequency 20KHz, duty cycle lower, speed go higher)
5	CW/CCW	Low Voltage signal for CW, high voltage signal for CCW.
6	Speed Signal	Motor speed signal output.

Note: When need motor to run without speed control, please short the Enable Pin (Pin4. EN) to any Ground Pin (Pin 1 or Pin 2). So, the motor will always operate in its' full speed.

Upper right P4 connector is the motor power supply. From right to left are motor A,B and C phase power supply, connection to them are motor power supply cables with Yellow, Red and Blue colors. Yellow for Phase A, Red for phase B, Blue for phase C.

Upper left is P3 connector for motor hall sensor, totally 5 pins, from right to left are hall power supply positive, hall power supply ground, hall A, hall B and Hall C. Hall cables connecting to these 5 pins from right to left are Red (Hall Positive), Black (Hall Ground), Yellow (Hall A), Red (Hall B) and Blue (Hall C).

Above are the typical connection between Assun Motor and Speed Driver. Note: When don't need Hall sensor, just don't connect the Hall cable to anything. If don't need Hall Cable, customer could contact our sales department for customization service.

4.2 Motor Functions

When motor connected to the controller with PWM function, the motor speed control could be achieved. In the controller setting, PWM frequency shall be 20-25 KHz. The percentage of low input voltage is regarded as the duty cycle. The higher the duty cycle, the higher the motor rotating speed will be. When duty cycle reaches 100%, the motor reaches its top speed. When the duty cycle is lower than 5%, the motor will stop running.

⚠ Note: Please avoid to set the duty ratio below 5%. When the duty cycle is needed to be lower than 5%, please set it directly to 0%.

When motor is not connected to the controller with rotation direction control, motor will be able to change rotating directions.

⚠ Note: When rotating speed over 100rpm, CAUTION do not reverse the motor direction while the motor is rotating! It is highly recommended to stop the motor before reversing motor rotational direction.

When motor is connected to controller with brake function, the motor will be controlled to brake accordingly.

⚠ Note: When use the brake function, motor power supply voltage will rise due to the motor's back EMF adding to the supply voltage. User shall test and adjust the speed for motor to start braking based on the specified load condition. If the voltage goes too high when braking, please set the motor to start braking in a lower speed to protect the motor and electronics.

5. Maintenance

The product series is maintenance free, please do not disassemble in person. There are no repairable components inside the motor. Regarding any quality issue or maintenance needs, please contact our regional service person for relevant technical support.

Ignoring this warning will void the warranty.

Appendix

Appendix 1. Series Product Parameters

Appendix 2. Specified Product Drawing and Parameters

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